Initialization of Beam Simulations using Particle Distributions Reconstructed from Experimental Data*

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In present-day experiments exploring the behavior of intense particle beams for Heavy Ion Fusion, a variety of diagnostics yield information on the beam particle distribution function. Good shot-to-shot reproducibility enables the acquisition of detailed 2D projections of the 4D transverse phase space using moving slits and Faraday cups. In trials using simulated beam data, we have observed a significant improvement in simulation fidelity when runs are initiated using synthesized (as opposed to simple-model) distributions based on slit scan data. We are employing such synthesis techniques to launch simulations with initial conditions developed from experimental data. More recently, in exploratory diagnostics, slits have been combined with scintillator-based imaging methods, and the use of multi-aperture hole plates is under study. These methods yield 3D (projectional) and 4D (full) phase space information, but with relatively coarse sampling. We are exploring the use of such data to initialize simulations.

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